

(12) UK Patent Application (19) GB (11) 2 137 132 A

(43) Application published 3 Oct 1984

(21) Application No 8407341

(22) Date of filing 21 Mar 1984

(30) Priority data

(31) 3312195 (32) 2 Apr 1983 (33) DE

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(51) INT CL³
B25D 17/04

(52) Domestic classification
B4K 2D 2F 4E 7G4A
U1S 1647 B4K

(56) Documents cited
GB 1307509

(58) Field of search
B4K
B4C
B5L

(54) Hand-guided percussion and drilling hammer

(57) A hand-guided percussion and drilling hammer has a handle (2) resiliently mounted relative to the hammer housing (1). The bottom of the handle (2) is less resiliently mounted than the top thereof to provide greater stability against lateral deviation with respect to the hammer housing (1). Hence, on the one hand, optimum vibration damping is provided during normal operation of the hammer and, on the other hand, direct contact between parts of the handle and parts of the housing cannot occur even when considerable pressure is applied to the handle of the hammer and during lateral turning of the handle, and moreover, the hammer is satisfactorily guideable at any time even when using heavy tools.

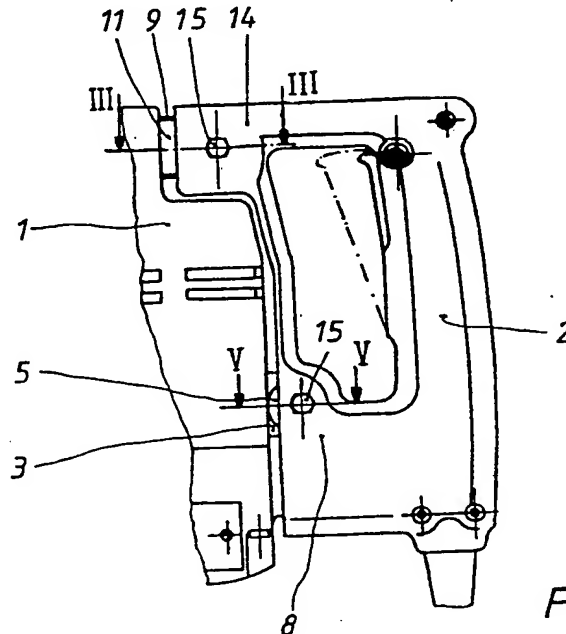
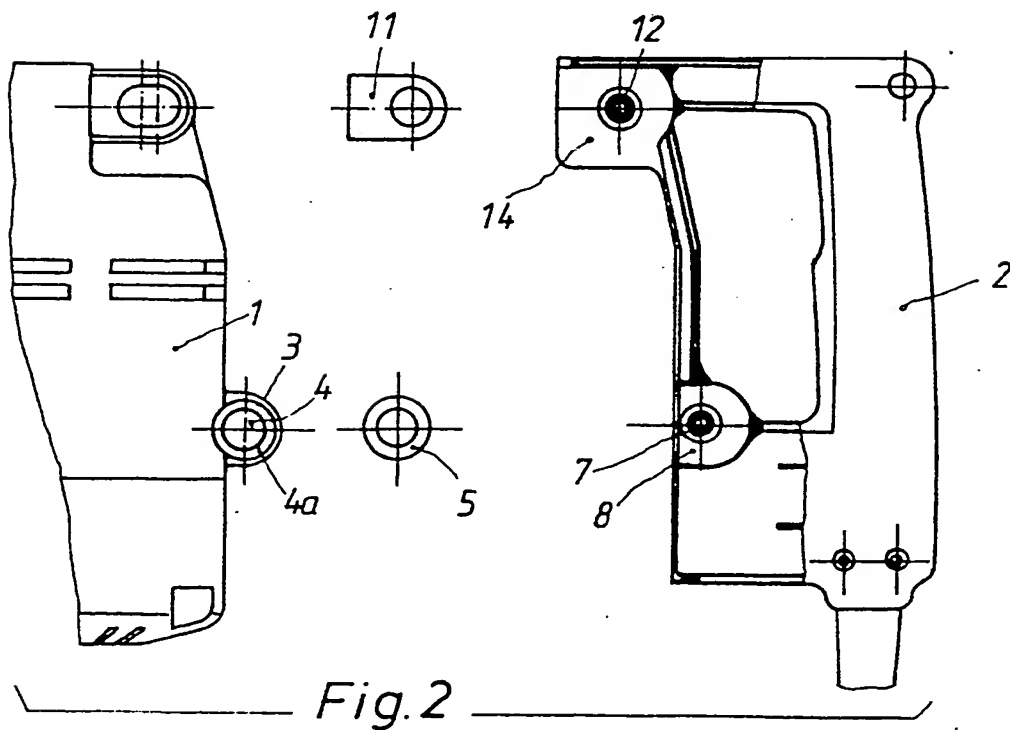
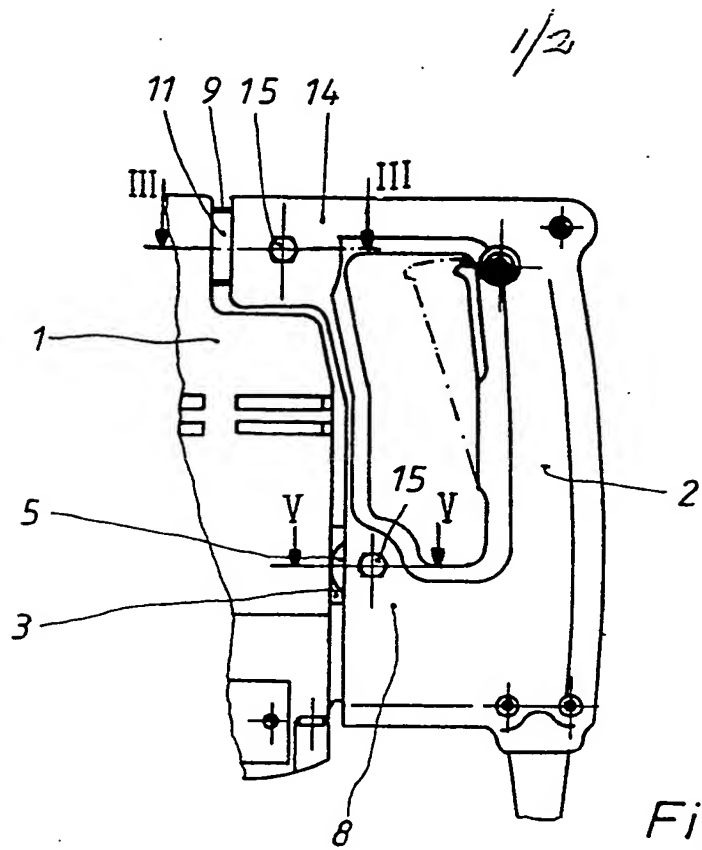


Fig. 1

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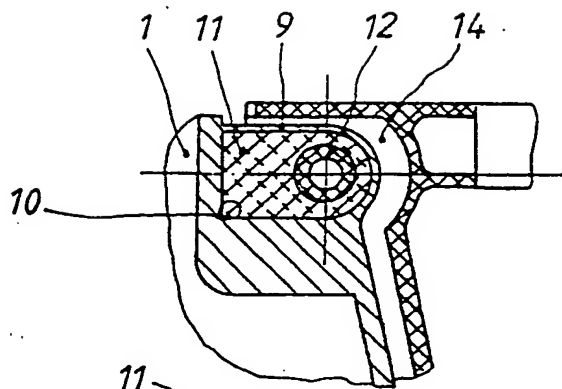


Fig. 4

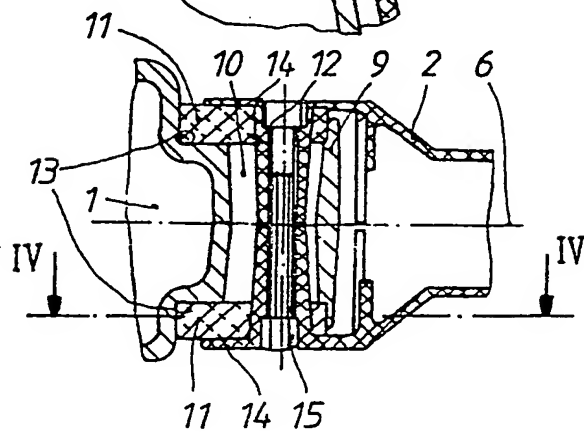


Fig. 3

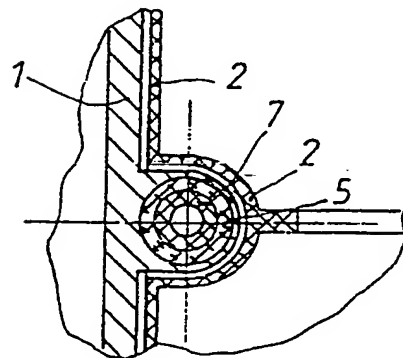


Fig. 6

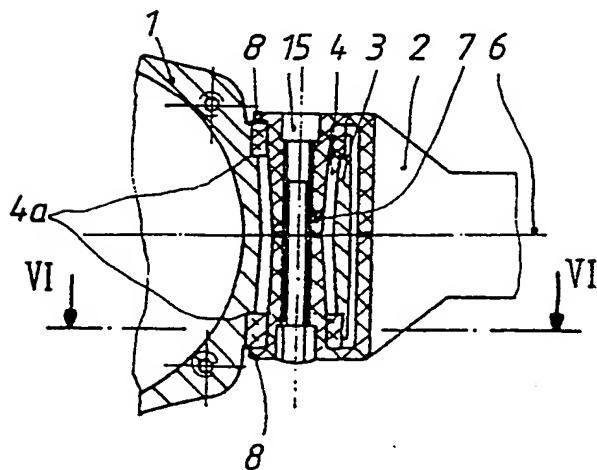


Fig. 5

SPECIFICATION

Hand-guided percussion and drilling hammer

The invention relates to a percussion and drilling hammer.

- 5 In percussion and drilling hammers of the type wherein the handle is resiliently secured to the top and bottom of the hammer housing, the purpose of the handle shock absorption means is to protect the operator against vibration necessarily
10 associated with the operation of such implements, this being of great importance, particularly in the case of larger machines having a corresponding load capacity, since, in this case, in addition to being troublesome, the vibrations are detrimental
15 to health in that they affect the operator's joints and the circulation of his blood.

- A large number of constructions have been proposed for the handle shock absorption means. In all these constructions, the characteristic of the
20 upper shock absorption means of the handle is substantially the same as, or at least similar to, that of the lower shock absorption means of the handle. Examples of this are the percussion and drilling hammers in accordance with German
25 Patent Specification No. 20 09 537 and German Offenlegungsschrift No. 31 21 882. In these known implements, the precise guideability of the hammer required during operation necessitates a relatively hard shock absorption means which,
30 however, has the disadvantage that the vibration transmitted from the hammer housing to the operator is not adequately damped. On the other hand, if the shock absorption means is made relatively soft in order to achieve satisfactory
35 vibration damping, this is done at the expense of precise guideability and, in the case of great pressure applied to the handle, the shock absorption means may yield to an extent that parts of the handle come into contact with the
40 hammer housing and give rise to jarring impacts. The same thing also happens when the handle has soft shock absorption means and is pressed sideways, which frequently occurs when working with implements of this kind.

- 45 An object of the invention is to design percussion and drilling hammers such that, on the other hand, optimum vibration damping is obtained during normal use, that is to say, the acceleration of the hammer housing towards the
50 operator is reduced to a considerable extent and, on the other hand, direct contact between parts of the handle and parts of the housing cannot occur even when considerable pressure is applied to the handle of the hammer and when the handle is
55 turned laterally, and, moreover, the hammer can be satisfactorily guided at any time even when using large working tools, such as drill bits, spading tools etc.

- The present invention resides in a hand-guided
60 percussion and drilling hammer whose handle is resiliently secured to the top and the bottom of the hammer housing, the bottom of the handle being mounted with less resilience than the top thereof, to provide greater stability against lateral

- 65 deviation with respect to the hammer housing.

In the hammer in accordance with the invention, the lower shock absorption means of the handle is designed so as to be relatively stable with only a slight spring travel. This enables the
70 great lateral stability required for the precise guideability of the hammer. In contrast to this, the upper shock absorption means is substantially softer, so that it can absorb vibrations to a considerable extent. The invention is based on the
75 knowledge that the pressure exerted on the hammer is exerted on the handle chiefly in the upper region, so that the upper shock absorption means is of primary importance for damping vibrations transmitted to the operator.

- 80 If the upper fastening means is less resiliently mounted in the direction of pull than in the direction of thrust, considerable pull can also be exerted when necessary, without damaging the resilient parts.

- 85 Advantageously, the lower fastening means comprises a hinge joint having substantially the same resilience in all radial directions. This results in a simple joint which has great operational reliability and great durability. Preferably spaced
90 damping rings are let into recesses in the housing and closely surround an axle in the lower end of the handle. This achieves particularly great lateral stability of the lower shock absorption means.

- Advantageously, the upper fastening means
95 comprises two mutually spaced damping elements of resilient material which are disposed along an axis at right angles to the central plane of the handle and which in each case on the one hand closely embrace an associated projecting
100 axle located on the handle approximately on a level with the said axis and, on the other hand, are inserted with a close fit in an associated opening in the hammer housing and whose end faces keep the hammer housing and the handle spaced apart
105 even in a lateral direction, the lengths of the damping elements from the axle on the handle inwardly to the hammer housing in the direction of thrust being substantially longer than their lengths from this axle outwardly in the direction of pull.

- 110 The shock absorption means is thus very soft when the handle is in its initial position and has a particularly high damping effect when only slight pressure, or small pressure, is applied, while the counter-force increases progressively as the
115 pressure applied increases and the handle is reliably prevented from coming into direct contact with the hammer housing. Moreover, this structural design of the upper shock absorption means can also be realised in a simple manner
120 and ensures great durability.

- The shock absorption means between the hammer housing and the handle is preferably a resilient material in the form of elastomers of cellular structure, such as resiliently foamed
125 polyurethane.

The invention will be further described hereinafter, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a side elevation of the rear portion of a

hammer having a handle which is resiliently mounted, in accordance with the invention.

Fig. 2 shows the hammer of Fig. 1 with the handle detached from the hammer housing, showing the resilient elements, that side of the handle which faces the hammer housing being shown in longitudinal section parallel to the plane of the drawing,

Fig. 3 is a cross section through the upper connection between the handle and the hammer housing, taken along the line III—III of Fig. 1,

Fig. 4 is a longitudinal section through the upper connection between the hammer housing and the handle, taken along the line IV—IV of Fig. 3,

Fig. 5 is a cross section through the lower connection between the hammer housing and the handle, taken along the line V—V of Fig. 1, and

Fig. 6 is a longitudinal section through the lower connection between the hammer housing and the handle, taken along the line VI—VI of Fig. 5.

The hammer illustrated in the drawings includes a hammer housing 1, only that part of the housing which is material to the invention, that is to say, the part adjacent to the handle 2, being illustrated.

For the purpose of interconnecting the hammer housing 1 and the handle 2 in a resilient manner at the bottom, a lug 3 having a through bore 4 is provided on the end face of the hammer housing 1 and extends at right angles to the longitudinal central plane, that is to say, at right angles to the plane of the drawing of Figs. 1, 2 and 6, as can be seen in Fig. 5, the bore 4 being widened at each of its outer ends to form a respective shoulder 4a. Rings of a resilient material, such as a material known under the trade name "Cellasto" or "Vulkocell," are inserted into the widened end portions of the bore 4. The lengths of the rings 5 are greater than the depth of the widened end portions of the bore, so that they project from the two ends of the bore 4 to some extent when they are inserted up to the shoulders 4a.

The handle 2, which can be split in the centre along the dash-dot line 6 (Fig. 3 and Fig. 5), forms, in the region of the lower connection between the handle and the hammer housing 1, a hollow axle 7 which extends at right angles to the central plane of the hammer between outer side walls 8 of the handle and which extends from the outer end face of one ring 5 to the outer end face of the other ring 5. The length can be somewhat shorter than the length between the aforesaid end faces when the rings are inserted in a free and unstressed state into the end portions of the bore, so that the rings are pressed together somewhat when the split handle 2 of the hammer is mounted onto the hammer housing and are interlocked with the insertion of the two parts of the axle 7 into the bore 8. Across its region which is located in the rings when the handle is interlocked, the axle 7 has approximately the same diameter as, but preferably a somewhat larger diameter than, the respective ring on the inside when in the

unstressed state, hence also resulting in a certain amount of compression of material, as in the latter case. The compression of the material during assembly and the properties of the material are chosen such that a relatively large degree of hardness ensues for the shock absorption means achieved by means of the rings 5 in the bore 4 and on the axle 7, and particularly such that the amount by which the rings 5 project out of the bore 4 is not overcome when the hammer is being put to heavy use, so that the handle and the hammer housing can never come into direct contact with one another.

In the described embodiment, the lower connection between the hammer housing 1 and the handle 2 forms between the said parts a resilient hinge having great lateral stability which is achieved by the relatively large distance between the rings 5 and the corresponding length of the axle 7.

The construction of the upper connection between the handle 2 and the hammer housing 1 is virtually the same as that of the lower connection at the handle end and similar to that of the lower connection at the hammer housing end. The difference at the hammer end resides in the fact that the upper lug 9, which also has a through bore 10 extending at right angles to the central plane of the hammer housing, is not widened circularly or counterbored all round at the end portions of the bore 10, as in the case of the lower extension, but is only circularly widened over the half facing the handle, although, viewed at right angles to the central plane of the hammer housing 1, it is widened rectangularly towards the hammer housing in order to receive a respective damping element of complementary configuration which is made from a resilient material such as "Cellasto" or "Vulkocell", that is to say, foamed polyurethane. These damping elements 11 also have, in the direction of the axle 12 of the handle corresponding to the axle 7, a dimension or thickness such that they project outwardly out of the bore 10 when they are inserted into widened end portions of the bore 10 up to the shoulder 13.

When the handle 6 is in its assembled state, the tops of its side walls are applied from the outside against the respective damping element 11 and, owing to the portion of the damping element 11 projecting out of the opening 10, the said side walls are at all times kept at a distance from the hammer housing 1 by the damping element even when the drill is under heavy use.

When the handle is fitted, the damping elements 11, through which the handle axle 12 also passes in the region of a circular bore, can also exhibit a certain amount of compression which, in conjunction with the properties of the material, results in the required stiffness which, however, is substantially less at the top, at least in the direction towards the hammer housing, than that of the lower shock absorption means. This results from the fact that the length of the resilient elements 11 extending from the handle axle 12 to the hammer housing is greater than their lengths

extending in the opposite direction towards the handle. A smaller amount of material is available for compression of the elements 11 in the direction towards the handle, that is to say, in the direction of pull, so that large tensile forces can be exerted in this direction with small elongation of the upper shock absorption means in order, for example, to release a jammed tool. Substantially more material is available in the opposite direction, that is to say, in the direction of thrust, and, consequently, is able to yield in a softer manner with larger elongation even from the zero position of the handle. As the thrust increases, the counter-thrust also progressively increases with a decreasing distance between the handle axle 12 and the hammer housing 1, although there is never any risk that the axle 7 or the overlapping side walls of the handle can come into abutment against the hammer housing 1, since, before such a state is reached, the material is compressed to an extent that the force applied by the operator is normally insufficient to cause this. In addition to this, the tops of the side walls 14 extend beyond the narrow portion of the bore 10 even towards the hammer housing 1, that is to say, overlap exists between the side walls and the shoulders 13 in the opening 10 at the hammer housing side, and, without destroying the resilient elements 11, does not permit direct contact between the handle and the hammer housing from the side.

Despite the high operational efficiency, the construction is very simple both with respect to the construction on the hammer housing and on the handle and also with respect to the design of the resilient elements, and ensures long durability.

The assembly, which is fixed by the tie bolts 15 (Figs. 1, 3 and 5) passing through the hollow axes 7 and 12, is just as simple.

40 CLAIMS

1. A hand-guided percussion and drilling hammer whose handle is resiliently secured to the top and the bottom of the hammer housing, the bottom of the handle being mounted with less resilience than the top thereof, to provide greater stability against lateral deviation with respect to the hammer housing.

2. A hammer as claimed in claim 1, in which, commencing from the non-stressed position of the

50 handle, the upper fastening means is less resiliently mounted in the direction of pull than in the direction of thrust.

3. A hammer as claimed in claim 1 or 2, in which the lower fastening means of the hammer handle is constructed substantially as a hinge joint which has a pivot axis approximately at right angles to the central plane of the handle, and approximately equal resilience on all sides radially of the pivot axis.

4. A hammer as claimed in claim 3, in which the radially resilient hinged joint comprises two mutually spaced damping rings of resilient material which are disposed coaxially of the pivot axis and which in each case on the one hand closely embrace an associated substantially circular projecting axle on the handle and, on the other hand, are inserted with a close fit into an associated, substantially circular recess in the hammer housing and whose end faces keep the hammer housing and the handle spaced apart, even in a lateral direction.

5. A hammer as claimed in any of claims 1 to 4, in which the upper fastening means comprises two mutually spaced damping elements of resilient material which are disposed along an axis at right angles to the central plane of the handle and which in each case on the one hand closely embrace an associated projecting axle located on the handle approximately on a level with the said axis and, on the other hand, are inserted with a close fit in an associated opening in the hammer housing and whose end faces keep the hammer housing and the handle spaced apart even in a lateral direction, the lengths of the damping elements from the axle on the handle inwardly to the hammer housing in the direction of thrust being substantially longer than their lengths from this axle outwardly in the direction of pull.

6. A hammer as claimed in any preceding claim, in which the shock absorption means between the hammer housing and the handle is provided by means of an elastic material in the form of elastomers having a cellular structure, such as resiliently foamed polyurethane.

7. A hand-guided percussion and drilling hammer, constructed substantially as herein described, with reference to and as illustrated in the accompanying drawings.